

SCIENCE SAVING RAINFORESTS



**Big Scrub
Rainforest
Conservancy**
The Voice of the Rainforest

photo: Iain Stych

Science Saving Rainforests

Is a cost-effective, internationally innovative program led by Big Scrub Rainforest Conservancy that utilises the latest DNA sequencing and genome analysis technology to help save from extinction Australia's critically endangered and internationally significant Gondwana-descended lowland subtropical rainforest and many of its threatened plant species. It will enhance the habitat of its rainforest-dependent threatened fauna and also help to save them from extinction.

The world-leading, genomics-based approach that underlies the *Science Saving Rainforests Program* can be applied elsewhere in Australia and around the world to the recovery of threatened ecological communities and other heavily degraded ecosystems and to the recovery of threatened plant species.

It can also be applied to increase the longevity of carbon sequestration and reforestation plantings.

The problem

What remains of Australia's 93% cleared, now critically endangered and highly fragmented lowland subtropical rainforest faces extinction because its key structural and threatened species mainly occur in small populations trapped in isolated remnants and are highly likely to lack genetic diversity and thus the evolutionary potential needed to avoid inbreeding depression and adapt to climate change, new diseases and new pests.

Lack of genetic diversity in many key species also threatens the long term viability of the 600 ha of restored rainforest that is developing from plantings of approximately 2.5 million trees in the Big Scrub region over the past 30 years.

Internationally innovative application of genomics to the rescue

Genetic diversity is a key indicator of species fitness and includes a species' capacity to survive and reproduce in the short term, and to adapt to changing conditions such as climate change, new diseases and new insects in the long term. The Science Saving Rainforests Program (SSR) is applying the latest DNA sequencing and genome analysis technology to restore optimal genetic diversity to key structural and threatened plant species of critically endangered lowland subtropical rainforest, thereby reducing the risk of extinction of this internationally unique Gondwana rainforest. The SSR Program is initially focussing on 30 threatened plant species and 30 key structural species that are major components of the closed canopy, which is the structural feature that defines rainforest and is the major contributor to its unique, ecosystem-defining microclimate.

DNA sequencing will be carried out on more than 10,000 leaf samples collected from between 50 and 850 individual trees across the range of each of the 60 species. Innovative genome analysis techniques will capture detailed genetic, climatic and ecological information on each species and identify approximately 20 individual trees or populations of each species that collectively have the optimal genetic diversity to reduce the potential of inbreeding depression and maximise resilience to predicted climate change conditions, emerging insects and diseases in the Big Scrub region. The analysis can be repeated to identify populations or individual trees with optimal genetic diversity for other regions.

Propagules, principally cuttings but where necessary seeds or juveniles, will be collected from the 20 targeted individuals or individuals in targeted populations of each of the 60 species.

Each of the 1200 propagules will be propagated to produce planting stock with optimal genetic diversity for use in restoration and recovery plantings in the Big Scrub region.





photo: Iain Stych

Demonstration of sustainable restoration and recovery planting

Big Scrub Rainforest Conservancy will, in consultation with its partners and relevant government agencies, use planting stock grown from the collected propagules to demonstrate the development of a sustainable restoration planting of critically endangered lowland subtropical rainforest comprising the 30 key structural species plus a wide range of pioneer and secondary species commonly used in restoration plantings. The planting will also provide sustainable habitat for translocation recovery plantings of discrete populations of up to 30 threatened species, each with optimal genetic diversity to help ensure their long term sustainability and survival.

Living seed bank: plantation producing seed with optimal genetic diversity

Planting stock propagated from the collected propagules will be used to develop a plantation that will be a living seed bank for the 30 key structural species (KSS) and 30 threatened species, excluding any species found to have little genetic diversity across its range.

The plantations will comprise up to 20 individuals of each species, or possibly more in the case of threatened species with small populations. Seed of each KSS produced in the plantation will have optimal genetic diversity for propagation and use in widespread restoration plantings of critically endangered lowland subtropical rainforest across the Big Scrub region. They will also be used to provide the best possible habitat in recovery plantings of the 30 threatened species. As trees in the plantation start flowering and fruiting, which could take up to ten years for some species, seeds of the key structural species will be harvested and provided to our partner nursery for propagation to produce

genetically diverse planting stock for distribution to other nurseries, rainforest restoration contractors and suitably experienced landholders and Landcare groups.

Seed of the threatened species will be propagated for use in recovery plantings. The plantation will continue to produce genetically diverse seeds for many decades into the future. It will provide a living seed bank.

Once the trees in the restoration plantings propagated from plantation seed reach maturity, their genetically optimal seed and pollen will be spread across the landscape, principally by insects, birds and bats. This flow of fit genes will enhance the reproductive capacity and resilience of these species to climate change, insects and diseases. This, in turn, will help to ensure the long term viability and survival of the rainforest community in both remnants and restoration plantings.

The first plantation

The first seed production plantation is on land provided by the NSW Department of Primary Industries located near Wollongbar in the Byron Bay hinterland in north eastern NSW.

Our vision

Our vision is to complete the development of the first plantation and demonstration restoration and recovery planting and then add at least another 20 important structural species that will further contribute to the survival and recovery of critically endangered lowland subtropical rainforest and its threatened species.





Experience counts

The founding partners and their key leaders involved in the SSR Program have outstanding experience that will ensure the Program's successful delivery.

Big Scrub Rainforest Conservancy - Dr Tony Parkes AO

Dr Parkes is the President, co-founder and leader for 30 years of Big Scrub Rainforest Conservancy (BSRC), formerly known as Big Scrub Landcare, which is coordinating the SSR Program and is responsible for raising the funding for the SSR Program and the development and operation of the plantation.

This multi-award-winning community not-for-profit organisation has an outstanding 30 year track record in achieving best-practice, cost effective outcomes in restoring critically endangered lowland subtropical rainforest. BSRC has completed more than 50 projects and received the Society for Ecological Restoration Australasia's 2016 Award for Restoration Excellence, the major scientific award in this field. Dr Parkes, who has a background in science, business and investment banking, was awarded an AO for his 30 years of community service in the conservation of critically endangered lowland subtropical rainforest. For further information on BSRC visit

www.bigscrubrainforest.org

The Royal Botanic Garden Sydney - Prof Maurizio Rossetto

Maurizio Rossetto is one of Australia's leading rainforest geneticists and is Head of The Royal Botanic Garden Sydney's Research Centre for Ecosystem Resilience.

The SSR Program is part of its acclaimed, internationally innovative Restore and Renew Program that is led by Professor Rossetto. The Royal Botanic Garden Sydney carries out research

in a number of fields and operates the Plant Bank and the National Herbarium of NSW. For more information visit www.rbg Syd.nsw.gov.au

Dr Robert Kooyman

Dr Kooyman is a leading Australian and international rainforest evolutionary ecologist and researcher, with more than 30 years experience as a field ecologist in Australia's lowland subtropical rainforest. For further information visit www.researchgate.net/profile/Robert_Kooyman

The Big Scrub Foundation - Dr Tony Parkes AO

Big Scrub Foundation, BSRC's sister organisation, is a charity that raises funding for this project and other projects run by BSRC to help save critically endangered lowland subtropical rainforest and its threatened species. For more information visit www.bigscrubfoundation.org

Firewheel Rainforest Nursery - Mr Mark Dunphy

Mr Dunphy, who has a degree in environmental science, is the founder and principal of Firewheel Rainforest Nursery, Australia's leading rainforest nursery. He is also a co-founder and Vice President of BSRC. He has pioneered the large-scale production of high-quality planting stock for rainforest restoration projects and has 30 years' experience restoring lowland subtropical rainforest. He is the lead author of the definitive book on rainforest seed propagation, Australian Rainforest Seeds. For more information visit www.firewheelnursery.com.au





Key supporters and collaborators

Stone & Wood Brewing Co: the leading Byron boutique brewery has donated \$1m to Big Scrub Foundation, which is helping to fund the SSR and ongoing Remnant Care Programs.

NSW Environmental Trust and the Saving our Species Program: are making substantial financial contributions to the SSR Program.

NSW Dept of Primary Industries (DPI): has provided land for the first plantation.

SoilCare Inc: provide advice and assistance in applying regenerative agriculture practices to the development and operation of the plantation.

Brookfarm Ltd and Cape Byron Distillery Ltd: provide assistance in promoting and funding of the SSR Program and in the development and operation of the plantation. These local companies are leading innovators in the production of premium food and liquor incorporating rainforest ingredients.

They are experienced in the design, development and operation of sustainable plantations for the production of macadamia nuts and rainforest botanicals. Mr Martin Brook, co-founder and Chair of both companies, also plays a key role in BSRC and was its previous Vice President.





Funding

The estimated cost of the Science Saving Rainforests Program from the outset to the establishment of the 60 species seed plantation and the demonstration restoration and recovery planting is approximately \$2m, supplemented by partners' in kind contributions of \$1.5m. We are seeking tax deductible donations and grants to complete this stage of the Science Saving Rainforests Program and then expand it to include additional species and to extend its scope beyond the Big Scrub. Please make a donation or a bequest to help save from extinction our beautiful lowland subtropical rainforest and its threatened species.

Donating is easy: simply transfer funds directly to **Big Scrub Foundation's Deductible Gift Fund** account called the **Rainforest Treasury**

BSB: 062-565: Account number: 1083 3458

and email us at info@bigscrubrainforest.org advising us of your donation so that we can email you a receipt for your tax deductible donation.

To donate online, please go to www.bigscrubrainforest.org

For further information please email

Dr Tony Parkes, President of BSRC and Executive Chair of Big Scrub Foundation at info@bigscrubrainforest.org





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